## III-22.01 Thin Lift Overlays and Contract Patching

### 1. General

Thin lift overlays and contract patching are used as a preventative maintenance (PMRRR) measures to prolong the life of a pavement, improve structural capacity, and improve highway conditions. See Section II-06 for the project concept report approval process.

A template that can be used for these types of projects is located on the web at www.state.nd.us/dot/designmanual.html, click "Design Manual Reference and Forms", under the Preventive Maintenance Table, pick districtplan.dot. An example of a contract patching project is located in Appendix III-22 A and an example of a chip seal project is in Appendix III-22 B.

### 2. Specifications

A. Design Specifications

1) The geometric design standards for minor reconstruction and resurfacing of two-lane rural highways are contained in Section I-06 of this Manual. The RRR standards are intended to preserve and extend the service life of existing highways and include safety and geometric enhancements. The PMRRR standards are intended to extend service life or prevent accelerated deterioration of existing two-lane rural highways. PMRRR projects may be approved without including safety and geometric enhancements.

   PMRRR projects include maintenance–type activities or strategies supported by the Pavement Management System. These strategies include thin lift overlays, asphalt wearing surfaces, seal coats, pavement repair, joint and crack sealing, etc.

   The RRR and PMRRR standards and guidelines are included in Sections I-06.03 and I-06.05 respectively.

2) The design standards for geometric features for rural interstate highways are contained in Section I-06.04 of this Manual for Resurfacing, Restoration, and Rehabilitation(I-3R).

3) The design standards for geometric features for multi–lane highways and urban (curb and gutter) sections are contained in the current AASHTO's "Policy on Geometric Design of Highways and Streets." If a project contains both rural and urban sections, the 3R Standards apply to the rural

portion and the AASHTO's "Policy on Geometric Design of Highways and Streets" applies to the urban portion.

4) The design standards for roadside safety features are contained in the current AASHTO's "Roadside Design Guide."

B. Shoulder Drop-offs/Edge Slough

The project plans should address the shoulder edge drop-offs that result from the thin lift and patching overlays. The drop-off may be corrected by either of two methods. The first method provides a slough with a minimum slope of 6%, which extends from the overlay to the shoulder surface. The second method provides for resurfacing the shoulder and forming a new slough. The new slough may vary in slope and treatment. For both methods the slough should be compacted. A plan note or typical section may be used to illustrate the method of drop-off correction. Examples of shoulder drop-off treatments are shown in Appendix I-06 D.

C. Overlay Transition Tapers

The thin lift overlays and patches should be transitioned from the existing pavement surface to the full depth of the overlay. The longitudinal length of the transition taper should be based on the following ratio; 50 ft per 1 in depth of overlay. To reduce the chances of the thin section of the taper from raveling, the District may require that the transitions be milled, especially if the anticipated paving date is late in the construction season. A project note may be used to provide for this additional work requirement. The sample project EX_PATCH, Appendix III-22A, incorporates this note and a detail drawing.

D. Design Exceptions

For preventive maintenance projects, no exceptions are needed for the retention of existing substandard features except for shoulder width that do not meet NDDOT 3R standards. In effect, the state is maintaining the project as built and as it was agreed upon in the project agreement. However, any new substandard features created, or existing ones made worse must be corrected or covered by an exception.

E. Hot Bituminous Pavement, Aggregate and Specification Selections

The department uses guidelines based on both Equivalent Annual Single Axle Loads (ESALs) and the proposed hot bituminous pavement tonnage to determine the class of aggregate and specifications for the highway project.

ESAL data for highway projects can be obtained from Transportation Data Management in the Planning and Programming Division. Table III-22.01 summarizes the pavement selection and specification requirements.

**TABLE III-22.01 – HOT BITUMINOUS PAVEMENT SELECTION AND SPECIFICATION GUIDELINES**

| 20 Yr. Design ESAL's | Class of Aggregate | HBP TONNAGE (thousands) | | | |
|---|---|---|---|---|---|
| | | 0 to 10 | >10 to 30 | >30 to 40 | >40 |
| <500,000 | Cl 27 | 408 | 408 | 409 QC/QA | 409 QC/QA |
| 500,000 to <1,000,000 | Cl 29 | 408 | 408 | 409 QC/QA | 409 QC/QA |
| 1,000,000 to <3,000,000 | Cl 31 | 408 | 409 QC/QA | 409 QC/QA | 409 QC/QA |
| >3,000,000 Interstate or Urban | Cl 33 | 408 | 409 QC/QA | 409 QC/QA | 409 QC/QA |

X Maintenance thin lift overlay and contract patching projects will use ordinary compaction. Projects will be reviewed on a case by case basis for additional compaction requirements.

X Interstate Projects will use Cl. 33 aggregate.

X Most Urban Projects will use Cl. 33 aggregate, the actual aggregate used will be determined by Materials & Research. Ordinary compaction may be used on urban projects where small quantities of HBP are being used for lane additions, street connections, and patching. Compaction and Mix Design requirements will be addressed at the PS&E.

X Recycled HBP Projects will be constructed according to Section 407.

F. Asphalt Cement Selection

The District Engineer determines the type of asphalt cement to use for thin lift overlays and contract patching. Generally PG 58-28 Asphalt Cement will be used for all hot bituminous pavements, including thin lift overlays and contract patching. Other types of asphalt cement may be used under special conditions such as hot recycled bituminous pavement and permeable stabilized base course. Testing of existing bituminous materials is required for determination of the asphalt cement for recycled bituminous mixtures.

1) Performance Grades

As part of implementing the Strategic Highway Research Program recommendations, NDDOT will specify Performance Graded (PG) asphalt

binders as replacements or in lieu of the specified penetration graded asphalt binders.

2) Acceptance of PG Asphalt Cement

Asphalt cement supplied as a PG grade will be accepted according to the combined states binder test group procedures. The asphalt supplier will certify that the product furnished to the project complies with the required specifications outlined by the Materials and Research Division. In order to supply asphalt material to NDDOT projects by certification, the supplier shall submit a letter to the NDDOT Materials and Research Engineer stating that the supplier will comply with the certification requirements.

G. Compaction and Acceptance Requirements

Specification requirements guidelines are shown in Table III-22.01. Thin lift overlay and contract patching projects should specify Section 408 Hot Bituminous Pavement and "ordinary compaction". Projects may be reviewed on a case by case basis for additional compaction requirements. Additional requirements must be approved by the Office of Project Development.

A 408 plan note should be included on all projects that specify ordinary compaction to revise several 408 specification requirements.

H. Traffic Control Requirements

Traffic control guidelines and requirements can be found in Section III-19. Plan notes, standard drawings, and detail drawings should address the following:

1) The method of traffic control and applicable standard drawings.
2) The intersection locations where signing is required.
3) The work area length limitation for contractor work and basis of estimate.
4) The estimated quantities and method of payment for traffic control devices.
5) The treatment for uneven pavement during construction phasing.
6) The treatment for shoulder drop-off during construction phasing.
7) Flagging requirements if different from daily work operation.

The designer needs to evaluate the project work zone when determining the method of traffic control. Projects consisting of many shorter patches spaced over a large area require different traffic control methods than a project with long patches in a small area.

In general traffic control methods for thin lift overlay and contract patching work for various types of roadways will be as follows:

| **Roadway Type** | **Method of Control** | **Standard Drawings** |
|---|---|---|
| Two Lane | Roadway Closure - controlled by flaggers and pilot cars | D-704-15, Layout A |
| Four Lane | Lane Closure | D-704-15, Layout C |
| Four Lane Divided | Lane Closure and flaggers | D-704-33 & 34 * |
| Interstate | Lane Closure and flaggers | D-704-35 * |

* In some cases it may be desirable to use Standard D-704-23, Layout P for contract patching projects, especially if the patches are shorter in length and have longer distances between patch locations. If Layout P is used flagging should be utilized as shown on Standards D-704-33, 34, & 35.

Example plan notes are on the web at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Notes”.

A traffic control devices list should be include in each set of plan. This devices list informs the contractor of the anticipated signs that will be need on the project. There is a spread sheet available on the web that should be used to develop this list. It can be found at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Sheets”, “Section 700”, “704.2 Traffic Control Devices List”.

## 3. Standard Drawings

Typical standard drawings that may be required for thin lift overlays and contract patching are as follows:

| | |
|---|---|
| D-20-1 | NDDOT Approved Abbreviations |
| D-20-2 | Linestyle |
| D-20-3 | Symbols |
| D-20-4 | NDDOT Utility Company Approved Abbreviations |
| D-203-6 | Standard 90 Degree Flared Intersection |
| D-203-8 | Section Line and Private Drive Approaches |
| D-704-2 | Traffic Control Coring Hot Bit. Pavement |
| D-704-7 | Breakaway System for Construction Zone Signs |
| D-704-8 | Breakaway System for Construction Zone Signs |
| D-704-9 | Construction Sign Details |
| D-704-10 | Construction Sign Details |
| D-704-11 | Construction Sign Details |
| D-704-12 | Construction Sign Details |
| D-704-13 | Barricade Details |
| D-704-14 | Construction Sign and Barricade Assembly Details |
| D-704-15 | Construction Sign and Barricade Location Details |
| D-704-19 | Construction Sign and Barricade Location Details |
| D-704-20 | Construction Sign and Barricade Location Details |
| D-704-21 | Construction Sign and Barricade Location Details |
| D-704-22 | Construction Sign and Barricade Location Details |
| D-704-23 | Construction Sign and Barricade Location Details |
| D-704-25 | Construction Sign and Barricade Location Details |
| D-704-26 | Construction Sign and Barricade Location Details |
| D-704-27 | Traffic Control Plan Moving Operations Conventional Highways |
| D-704-28 | Traffic Control for Mobile Operations |
| D-704-33 | Sign Layout for One Lane Closure |
| D-704-34 | Sign Layout for One Lane Closure |
| D-704-35 | Sign Layout for One Lane Closure – Interstate System |
| D-762-1 | Pavement Marking Message Details |
| D-762-2 | Interstate Pavement Marking |
| D-762-3 | Striping for Flared Intersections |
| D-762-4 | Pavement Marking |
| D-762-6 | Short Term Pavement Marking |

The current version of standard drawings can be found on the web at www.state.nd.us/dot/designmanual.html under Standard Drawings.

## 4. Plan Notes

Typical plan notes that may be required for thin lift overlays and contract patching can be be found on the web at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, click “Plan Notes” or “Standard Notes”.

## 5. Basis of Estimate

The basis of estimate should contain the following information on the thin lift overlay and contract patching. A suggested format for the basis of estimate follows and is also shown with sample project, EX_PATCH, Appendix III-22 A.

A. List of Special Provisions: List the special provisions pertaining to the project.

B. Scope of Work: The scope of work should provide a general description of the project including the highway number, boundaries or limits, exceptions, highway ADT, and work locations. The scope of work may be written text or graphical representation.

Example - Written Text:

| | |
|---|---|
| Scope of Work: | U.S. 2, from junction ND 1 to mile point 307 (both roadways) |
| Exceptions: | None |
| ADT: | Total = 3259, Passenger = 2629, Truck = 630 |

C. Overlay/Patch Locations: The locations of the individual work areas should be summarized to provide: the applicable typical section number, beginning and ending mile points or stations, length of each section, section description, and total length of work.
Example:

| **Overlay/Patch Locations:** | | | | |
|---|---|---|---|---|
| **Typical Section** | **Begin Mile Point** | **End Mile Point** | **Length* (Miles)** | **Description** |
| 1 | 295.468 | 295.831 | 0.363 | Eastbound |
| 1 | 295.468 | 300.764 | 5.296 | Westbound |
| 1 | 301.231 | 304.856 | 3.625 | Eastbound |
| 1 | 305.219 | 306.819 | 1.600 | Westbound |
| | | **Total Length** | **10.884** | |

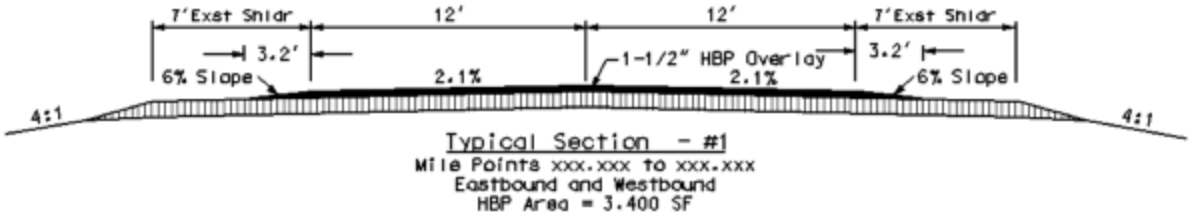
* Length does not include the 75 ft begin and end transition tapers.

D. Typical Sections: The required typical sections should be shown for each thin lift overlay or contract patch work area. Typical sections may be written text or graphical representation.

1) Example - Written Text:

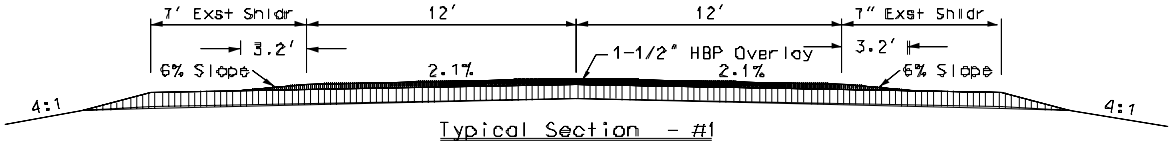
Location: All
Description: 24 ft width, 1.5 in depth, (2) shoulder sloughs @ 6% slope = 2 @ 3.2 ft width
Cross Sectional Area: HBP Cl 27 = 3.400 sf

2) Example - Graphical:




Typical Section - #1
Mile Points xxx.xxx to xxx.xxx
Eastbound and Westbound
HBP Area = 3.400 SF

3) Example - Graphical with basis of estimate:




Typical Section - #1
Mile Point xxx.xxx to xxx.xxx
Mile Point xxx.xxx to xxx.xxx
HBP Area = 3.400 SF

Basis of Estimate

| Description | Unit | Width (ft) | Unit/Mile |
|---|---|---|---|
| SS-1h or CSS-1h Emulsified Asphalt @ 0.05 gal/sy for tack coat | GAL | 24+2(3.2) | 892 |
| Hot Bituminous Pavement Cl 27 @ 2.0 ton/cy | TON | 24+2(3.2) | 1330 |
| 120-150 Asphalt Cement @ 6% of HBP Cl 27 | TON | | 79.8 |

* Does not include the 50 ft begin and end transition tapers.

E. Design Calculations: As a minimum, the basis of estimate should identify the work item material, rate of application per contract pay unit, and the material use for the given rate of application. Additional information such as "unit quantity per mile" may be provided for ease of application. Typical pay item descriptions

and design calculations are provided in Appendix III-22 C "Typical Pay Item Descriptions and Design Calculations".

Design calculations should be grouped and organized by similar pay items such as:

- Surfacing Quantities
- Pavement Marking Quantities
- Miscellaneous Quantities
- Traffic Control Devices List

Example:

| **Design Calculations:** | | | |
|---|---|---|---|
| **Description** | **Unit** | **Width (ft)** | **Unit/Mile Section 1** |
| Surfacing Quantities: | | | |
| SS-1h, CSS-1h, or MS-1 Emulsified Asphalt @ 0.05 gal/sy for tack coat | GAL | 24+6.4 | 892 |
| Hot Bituminous Pavement Cl 27 @ 2.0 ton/cy | TON | 24+6.4 | 1330 |
| PG 58-28 Asphalt Cement @ 6% of HBP Cl 27 | TON | | 79.8 |
| Additional Surfacing Quantities: | SS1-h (GAL) | HBP Cl 27 (TON) | 120-150 (TON) |
| Begin and End Tapers: | 68 | 50 | 3 |
| Pavement Marking Quantities: | | | |
| Short Term - 4 Inch Line (Painted, Tape or Raised Markers): 4" white lane lines, 10' line, 30' skip | LF | | 1320 |
| Pavement Marking Painted - 4 in line | | | |
| 4" white lane lines, 10' line, 30' skip | LF | | 1320 |
| 4" white edge line | LF | | 5280 |
| 4" yellow edge line | LF | | 5280 |

The Traffic Control Devices List should be included after the design calculations. For the most recent list go to the web at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Sheets”, “Section 700”, “704.2 Traffic Control Devices List”. Appendix III-22 A shows traffic control devices commonly used on contract patching projects.

## 6. Typical Sections

Typical Sections may be depicted as written descriptions or graphical representations. If written descriptions are used, the typical section should be written in the basis of estimate. If graphical representations are used, the typical sections should be in the basis of estimate if quantities are indicated, or under the detail drawings if no quantities are indicated. Both methods are shown above.

The typical section should address treatment of the driving lanes, shoulders, and sloughs and indicate the overall cross sectional area for each pay item. Simple sections, that require surfacing only and are easily described, work well as written text. Complex sections, that require multiple surface treatments, shoulder treatments, and are difficult to describe, should be graphically represented. The typical sections should be numbered for easy cross reference.

## 7. Pay Items

Typical pay items that may be required for thin lift overlay and contract patching projects are as follows. All items should be verified that they are an active bid item by reviewing the mainframe (RIMS#HP).

| Item No. | Spec No. | Code No. | Description | Units | Estimated Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| 1 | 103 | 0100 | CONTRACT BOND | L SUM | | | |
| 2 | 202 | 0132 | REMOVAL OF BITUMINOUS SURFACING | SY | | | |
| 3 | 202 | 0135 | REMOVAL OF BITUMINOUS SURFACING | TON | | | |
| 4 | 401 | 0151 | SS1H EMULSIFIED ASPHALT | GAL | | | |
| 5 | 401 | 0150 | SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT | GAL | | | |
| 6 | 408 | 0176 | HOT BITUMINOUS PAVEMENT CL 27 | TON | | | |
| 7 | 408 | 0185 | HOT BITUMINOUS PAVEMENT CL 29 | TON | | | |
| 8 | 408 | 0188 | HOT BITUMINOUS PAVEMENT CL 31 | TON | | | |
| 9 | 408 | 0190 | HOT BITUMINOUS PAVEMENT CL 33 | TON | | | |
| 10 | 408 | 0198 | HOT BITUMINOUS PAVEMENT PATCHING | TON | | | |
| 11 | 408 | 0199 | HOT BITUMINOUS MIX SUPPLIED | TON | | | |
| 12 | 408 | 0445 | PG 58-28 ASPHALT CEMENT | TON | | | |
| 13 | 408 | 9605 | CORED SAMPLE-BITUMINOUS PAVEMENT | EA | | | |
| 14 | 702 | 0100 | MOBILIZATION | L SUM | | | |
| 15 | 704 | 0100 | FLAGGING | MHR | | | |
| 16 | 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | | | |
| 17 | 704 | 1052 | TYPE III BARRICADE | EA | | | |
| 18 | 704 | 1060 | DELINEATOR DRUMS | EA | | | |
| 19 | 704 | 1065 | TRAFFIC CONES | EA | | | |

| Item No. | Spec No. | Code No. | Description | Units | Estimated Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| 20 | 704 | 1067 | TUBULAR MARKERS | EA | | | |
| 21 | 704 | 1081 | VERTICAL PANELS-BACK TO BACK | EA | | | |
| 22 | 704 | 1087 | SEQUENCING ARROW PANEL-TYPE C | EA | | | |
| 23 | 704 | 1100 | TRAFFIC CONTROL | L SUM | | | |
| 24 | 704 | 1185 | PILOT CAR | HR | | | |
| 25 | 706 | 0300 | FIELD LABORATORY-TYPE C | EA | | | |
| 26 | 762 | 0103 | PVMT MK PAINTED MESSAGE | SF | | | |
| 27 | 762 | 0128 | PLASTIC PVMT MK FILM MESSAGE | SF | | | |
| 28 | 762 | 0405 | SHORT TERM 4IN BROKEN LINE-PNT TAPE OR RSD MRK | LF | | | |
| 29 | 762 | 0410 | SHORT TERM 4IN LINE NPZ-PN TP OR RS MRK | LF | | | |
| 30 | 762 | 0430 | SHORT TERM 4IN LINE-TYPE NR | LF | | | |
| 31 | 762 | 0432 | SHORT TERM 6IN LINE-TYPE NR | LF | | | |
| 32 | 762 | 0434 | SHORT TERM 8IN LINE-TYPE NR | LF | | | |
| 33 | 762 | 0436 | SHORT TERM 24IN LINE-TYPE NR | LF | | | |
| 34 | 762 | 0442 | SHORT TERM MESSAGE-TYPE NR | SF | | | |
| 35 | 762 | 1104 | PVMT MK PAINTED 4IN LINE | LF | | | |
| 36 | 762 | 1106 | PVMT MK PAINTED 6IN LINE | LF | | | |
| 37 | 762 | 1108 | PVMT MK PAINTED 8IN LINE | LF | | | |
| 38 | 762 | 1124 | PVMT MK PAINTED 24IN LINE | LF | | | |
| 39 | 762 | 1204 | PLASTIC PVMT MK FILM 4IN LINE | LF | | | |
| 40 | 762 | 1206 | PLASTIC PVMT MK FILM 6IN LINE | LF | | | |
| 41 | 762 | 1208 | PLASTIC PVMT MK FILM 8IN LINE | LF | | | |
| 42 | 762 | 1224 | PLASTIC PVMT MK FILM 24IN LINE | LF | | | |

## III-22.02 Seal Coats

### 1. General

Seal coats are used as a preventative maintenance measure to prolong the life of a pavement, correct surface raveling and oxidation, and to provide skid resistance to worn pavements.

The first time a seal coat is placed on a HBP project, all surfacing including approaches and drives are typically seal coated. On second time seal coat projects, the approaches and drives may be omitted. On rural projects, it is common practice to apply the asphalt seal the full width of the roadway (driving lanes and shoulders) and then apply a cover coat the width of the driving lanes plus a nominal distance. At locations where traffic crosses the seal, such as intersections, and where the roadway passes through a marshy area, the cover coat should extend across the entire width of the seal application. On urban projects, the cover coat should extend the full width of the asphalt seal to eliminate

tracking, pickup, etc. associated with active traffic. The plans should clearly identify the extent of work to be performed.

There is a template that can be used for these types of project on the web at www.state.nd.us/dot/designmanual.html, click "Design Manual Reference and Forms", under the Preventive Maintenance Table, pick districtplan.dot.

## 2. Specifications

The design standards for highway seal coats are contained in the current edition of the NDDOT Seal Coat Manual from the Maintenance and Engineering Services Division. The District Engineer will select the type of asphalt to use on the project. The designer should prepare the plans and calculate the quantities using the following asphalt and aggregate selection and application rate guidelines.

A. Aggregate Selection

The different classes of aggregate to use for seal coat projects are: Class 41 chip, Class 42 chip, Class 43 chip, and Class 45 sand. The District selects the aggregate based on the type of asphalt that is to be used.

Ideally the chips should be cube-shaped. Flat or elongated particles tend to become aligned on their flat sides and are covered with asphalt. Additional chips lay on top of the flat chips and are not embedded properly into the asphalt. To get proper chip retention, the aggregate should be embedded into the oil so it is covered about 60-70%.

1. Class 41 Chips: Class 41chips have the same gradation as regular Class 43 chips except the percentage of material passing the 200 sieve has been modified. The Class 41 chips are used with CRS 2P emulsified asphalt.

2. Class 42 Chips: Class 42 chips are a graded chip and contain a larger amount of material passing the 200 sieve. When using a Class 42 chip a high float medium set (HFMS) emulsion or an MC 3000 should be specified.

3. Class 43 Chips: Class 43 chips are a graded chip and have a smaller percentage of material passing the 200 sieve. The Class 43 chip should be used with a high float rapid set (HFRS) emulsion. An HFMS or an MC 3000 may be used, but the slower setting time of the oil requires traffic control for longer periods of time and leaves the project more vulnerable to adverse weather.

4. Class 45 Sand: Sand seals are no longer used by NDDOT on the mainline as part of a seal coat project. The District Engineer may elect to use sand seals on shoulders and to cover maintenance patches.

The surface of the chips should be relatively clean no matter if a Class 42 or a Class 43 is being used. Dusty or dirty aggregate may prevent the asphalt from adhering to the aggregate. Flushing the chips may help eliminate this problem. In some parts of the state, chips are coated with a clay film that cannot be flushed away. If this is a problem, the District should include a note in the plans to require the chips to be washed. The chips may be drained to remove excessive water.

B. Asphalt Selection

MC-3000 & MC-3000P
Aggregate Application Rate: 25.0 lb/yd$^2$ (13.6 kg/m$^2$)
Asphalt Application Rate: 0.28 gal/yd$^2$ (1.27 l/m$^2$)

HFMS-2, HFRS-2, HFRS-2P, and CRS-2P
Aggregate Application Rate: 25.0 lb/yd$^2$ (13.6 kg/m$^2$)
Asphalt Application Rate: 0.38 gal/yd$^2$ (1.72 l/m$^2$)

C. Fog Coat application

The district may apply a fog coat if approved by the district engineer when using high float asphalt for seal coats. The fog coat should be SS-1h or CSS-1h Emulsified Asphalt applied at a rate of 0.05 gal/sy.

D. Traffic Control Requirements

Traffic control guidelines and requirements can be found in Section III-19. On two-lane, two-way traffic highways, the designer should review the requirements of Section 420.04E of the Standard Specifications and adjust the estimated quantities accordingly. Plan notes, standard drawings, and detail drawings should address the following:

1) The method of traffic control and applicable standard drawings.
2) The intersection locations where signing is required.
3) The work area length limitation for contractor work and basis of estimate.
4) The estimated quantities and method of payment for traffic control devices.

5) Flagging requirements if different from daily work operation.

The designer needs to evaluate the project work zone when determining the method of traffic control. In general, traffic control methods for seal coat work for various types of roadways will be as follows:

| **Roadway Type** | **Method of Control** | **Standard Drawings** |
|---|---|---|
| Two Lane | Roadway Closure - controlled by flaggers and pilot cars | D-704-15, Layout A |
| Four Lane | Lane Closure | D-704-15, Layout C |
| Four Lane Divided | Lane Closure and flaggers | D-704-33 & 34 |
| Interstate | Lane Closure and flaggers | D-704-35 |

Example plan notes and descriptions of usage are on the web at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Notes”.

A traffic control devices list should be include in each set of plan. This devices list informs the contractor of the anticipated signs that will be need on the project. There is a spread sheet available on the web that should be used to develop this list. It can be found at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Sheets”, “Section 700”, “704.2 Traffic Control Devices List”.

## 1. Standard Drawings

Typical standard drawings that may be required for seal coats are as follows:

| | |
|---|---|
| D-20-1 | NDDOT Approved Abbreviations |
| D-20-2 | Linestyle |
| D-20-3 | Symbols |
| D-20-4 | NDDOT Utility Company Approved Abbreviations |
| D-203-6 | Standard 90 Degree Flared Intersection |
| D-203-8 | Section Line and Private Drive Approaches |
| D-704-3 | Lane Markers for Seal Jobs Only |
| D-704-7 | Breakaway System for Construction Zone Signs |
| D-704-8 | Breakaway System for Construction Zone Signs |
| D-704-9 | Construction Sign Details |
| D-704-10 | Construction Sign Details |
| D-704-11 | Construction Sign Details |
| D-704-12 | Construction Sign Details |

| | |
|---|---|
| D-704-13 | Barricade Details |
| D-704-14 | Construction Sign and Barricade Assembly Details |
| D-704-15 | Construction Sign and Barricade Location Details |
| D-704-19 | Construction Sign and Barricade Location Details |
| D-704-20 | Construction Sign and Barricade Location Details |
| D-704-21 | Construction Sign and Barricade Location Details |
| D-704-22 | Construction Sign and Barricade Location Details |
| D-704-23 | Construction Sign and Barricade Location Details |
| D-704-26 | Construction Sign and Barricade Location Details |
| D-704-27 | Traffic Control Plan Moving Operations Conventional Highways |
| D-704-28 | Traffic Control for Mobile Operations |
| D-704-33 | Sign Layout For One Lane Closure |
| D-704-34 | Sign Layout For One Lane Closure |
| D-704-35 | Sign Layout For One Lane Closure Interstate System |
| D-762-1 | Pavement Marking Message Details |
| D-762-2 | Interstate Pavement Marking |
| D-762-3 | Striping for Flared Intersections |
| D-762-4 | Pavement Marking |
| D-762-6 | Short Term Pavement Marking |

The current version of standard drawings can be found on the web at www.state.nd.us/dot/designmanual.html under Standard Drawings.

## 2. Plan Notes

Typical plan notes that may be required for seal coats can be found on the web at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Notes” or “Standard Notes”.

## 3. Basis of Estimate

The basis of estimate should contain the following information for seal coat projects. A suggested format for the basis of estimate follows and is also shown with sample project, EX_SEAL, Appendix III-22 B.

A. List of Special Provisions: List the special provisions pertaining to the project.

B. Scope of Work: The scope of work should provide a general description of the project including the highway number, boundaries or limits, exceptions, highway ADT, and work locations. The scope of work may be written text or graphical representation.

Example - Written Text:

Scope of Work: U.S. 52 from junction ND 15 to junction ND 200
Exceptions: Station 612+98.5 ∀ 50 ft - Railroad Crossing

ADT: Total = 1050, Passenger = 757, Truck = 293

C. Seal Coat Locations: The locations of the individual work areas should be summarized to provide: the applicable typical section number, beginning and ending mile points or stations, length of each section, section description, and total length of work. The designer should address miscellaneous areas such as intersections, approaches, etc. If no miscellaneous areas are to be sealed, a statement should be included in the basis of estimate indicating no additional areas will be sealed.

Example:

| **Seal Coat Locations*:** | | | | |
|---|---|---|---|---|
| **Typical Section** | **Begin Mile Point** | **End Mile Point** | **Length (Miles)** | **Description** |
| 1 | 185.548 | 198.717 | 13.169 | |
| | | **Miles Gross** | 13.169 | |
| | | **Miles Net** | 13.150 | |

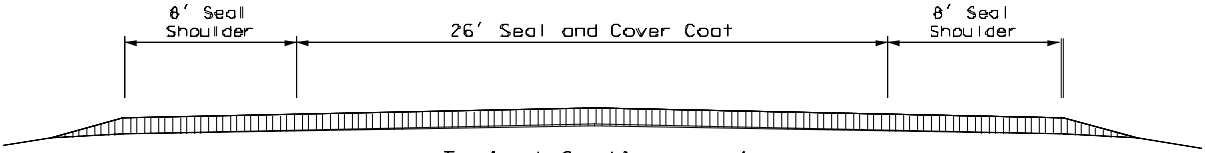
* Intersections and approaches will not be sealed except as shown.

D. Typical Sections: The required typical sections should be shown for each seal coat work area. Typical sections may be written text or graphical representation.

1) Example - Written Text:

Location: Mile Point 185.548 to 198.717
Description: 26 ft width seal and cover coat, (2) 8 ft shoulder seals

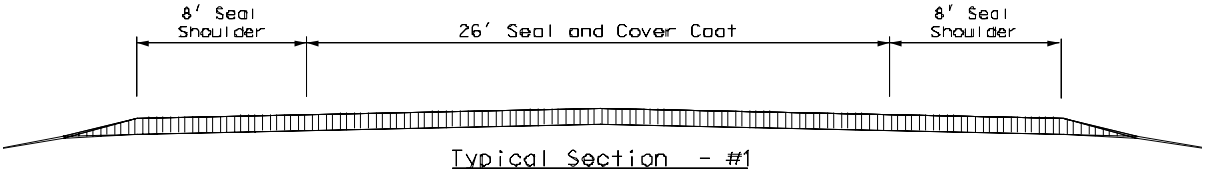
2) Example - Graphical:




Typical Section - #1

Mile Point xxx.xxx to xxx.xxx

3) Example - Graphical with basis of estimate:




Typical Section - #1

Mile Point xxx.xxx to xxx.xxx
Mile Point xxx.xxx to xxx.xxx

Basis of Estimate

| Description | Unit | Width (ft) | Unit/Mile |
|---|---|---|---|
| HFMS-2 Emulsified Asphalt @ 0.40 gal/sy | GAL | 26 | 6101 |
| Cover Coat Material Cl 42 @ 25 lbs/sy | TON | 26 | 191 |
| HFMS-2 Emulsified Asphalt @ 0.20 gal/sy (Shoulder) | GAL | (2) at 8' ea | 1877 |

E. Design Calculations: As a minimum, the basis of estimate should identify the work item material, rate of application per contract pay unit, and the material use for the given rate of application. Additional information such as "unit quantity per mile" may be provided for ease of application. Typical pay item descriptions and design calculations are provided in Appendix III-22 C, "Typical Pay Item Descriptions and Design Calculations".

Design calculations should be grouped and organized by similar pay items such as:

- Surfacing Quantities
- Pavement Marking Quantities
- Miscellaneous Quantities
- Traffic Control Devices List

Example:

| **Design Calculations:** | | | |
|---|---|---|---|
| Surfacing Quantities: | **Unit** | **Width** | **Unit/Mile** |
| HFMS-2 Emulsified Asphalt @ 0.40 gal/sy (Driving Lanes) | GAL | 26' | 6101 |
| Cover Coat Material Cl 42 @ 25 lbs/cy | TON | 26' | 191 |
| HFMS-2 Emulsified Asphalt @ 0.20 gal/sy (Shoulder) | GAL | 2 @ 8' | 1877 |
| Additional Surfacing Quantities: | | HFMS-2 (GAL) | Cl 42 (TON) |
| - Intersection Sta 951+45.5 (Hwy 15) | | 1660 | 52 |
| - Intersection Taper Sta 960+39.4 | | 578 | 18 |
| - 2 Flared Intersection Sta 977+00 Lt | | 250 | 8 |
| - Flared Intersection Type B Sta 697+66.5 (Hwy 200) | | 322 | 10 |
| Pavement Marking Quantities: | **Unit** | **Unit/Location** | **Unit/Mile** |
| Short Term Painted line - Seal Jobs | | | |
| 4" yellow center lines, 10" lines, 30' skip | LF | | 1320 |
| 4" yellow barrier line | LF | | 990 |
| Plastic Pavement Marking Film Message | | | |
| Railroad cross and RR's, 3 bands | | | |
| (2) Crosses and (4) R's | | 130 | |
| (6) Bands | | 144 | |
| Pavement Marking Painted Line | | | |
| 4" yellow center lines, 10" lines, 30' skip | LF | | 1320 |
| 4" yellow barrier line | LF | | 990 |
| - Railroad crossing | LF | 1240 | |
| 4" white edge line | LF | | 10560 |
| - Intersection Sta 951+45.5 (Hwy 15) | LF | 740 | |
| - Intersection Taper Sta 960+39.4 | LF | 900 | |
| - 2 Flared Intersection Sta 977+00 Lt | LF | 310 | |
| - Flared Intersection Type B Sta 697+66.5 (Hwy 200) | LF | 620 | |

The Traffic Control Devices List should be included after the design calculations. For the most recent list go to the web at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Sheets”, “Section 700”, “704.2 Traffic Control Devices List”. Appendix III-22 B shows traffic control devices commonly used on seal coat projects.

## 6. Typical Sections

Typical Sections may be depicted as written descriptions or graphical representations. If written descriptions are used, the typical section should be written in the basis of estimate. If graphical representations are used, the typical sections should be in the basis of estimate if quantities are indicated, or under the detail drawings if no quantities are indicated. Both methods are shown above.

## 7. Pay Items

Typical pay items that may be required for seal coats are as follows. All items should be verified that they are an active bid item by reviewing the mainframe.

| Item No. | Spec No. | Code No. | Description | Units | Estimated Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| 1 | 103 | 0100 | CONTRACT BOND | L SUM | | | |
| 2 | 107 | 0100 | RAILROAD PROTECTION INSURANCE | L SUM | | | |
| 3 | 420 | 0010 | MC3000P | GAL | | | |
| 4 | 420 | 0025 | HFRS2P | GAL | | | |
| 5 | 420 | 0104 | MC3000 LIQUID ASPHALT | GAL | | | |
| 6 | 420 | 0111 | CRS2P EMULSIFIED ASPHALT | GAL | | | |
| 7 | 420 | 0112 | HFMS2 EMULSIFIED ASPHALT | GAL | | | |
| 8 | 420 | 0115 | HFRS2 EMULSIFIED ASPHALT | GAL | | | |
| 9 | 420 | 0140 | COVER COAT MATERIAL CL 42 | TON | | | |
| 10 | 420 | 0144 | COVER COAT MATERIAL CL 43 - MODIFIED | TON | | | |
| 11 | 420 | 0145 | COVER COAT MATERIAL CL 43 | TON | | | |
| 12 | 420 | 0146 | COVER COAT MATERIAL CL 45 | TON | | | |
| 13 | 420 | 0160 | BLOTTER MATERIAL CL 44 | TON | | | |
| 14 | 702 | 0100 | MOBILIZATION | L SUM | | | |
| 15 | 704 | 0100 | FLAGGING | MHR | | | |
| 16 | 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | | | |
| 17 | 704 | 1052 | TYPE III BARRICADE | EA | | | |
| 18 | 704 | 1060 | DELINEATOR DRUMS | EA | | | |
| 19 | 704 | 1065 | TRAFFIC CONES | EA | | | |
| 20 | 704 | 1067 | TUBULAR MARKERS | EA | | | |
| 21 | 704 | 1081 | VERTICAL PANELS-BACK TO BACK | EA | | | |
| 22 | 704 | 1087 | SEQUENCING ARROW PANEL-TYPE C | EA | | | |
| 23 | 704 | 1100 | TRAFFIC CONTROL | L SUM | | | |
| 24 | 704 | 1185 | PILOT CAR | HR | | | |
| 25 | 762 | 0103 | PVMT MK PAINTED MESSAGE | SF | | | |
| 26 | | | | | | | |

| Item No. | Spec No. | Code No. | Description | Units | Estimated Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| | 762 | 0128 | PLASTIC PVMT MK FILM MESSAGE | SF | | | |
| 27 | 762 | 0460 | SHORT TERM PAINTED LINE-SEAL JOBS | LF | | | |
| 28 | 762 | 1104 | PVMT MK PAINTED 4IN LINE | LF | | | |
| 29 | 762 | 1106 | PVMT MK PAINTED 6IN LINE | LF | | | |
| 30 | 762 | 1108 | PVMT MK PAINTED 8IN LINE | LF | | | |
| 31 | 762 | 1124 | PVMT MK PAINTED 24IN LINE | LF | | | |
| 32 | 762 | 1204 | PLASTIC PVMT MK FILM 4IN LINE | LF | | | |
| 33 | 762 | 1206 | PLASTIC PVMT MK FILM 6IN LINE | LF | | | |
| 34 | 762 | 1208 | PLASTIC PVMT MK FILM 8IN LINE | LF | | | |
| 35 | 762 | 1224 | PLASTIC PVMT MK FILM 24IN LINE | LF | | | |

## 8. Checklist

The notes referenced below can be found on the web as either plan notes or standard notes at www.state.nd.us/dot/designmanual.html, click “Plan Preparation Guide”, “Plan Notes” or “Standard Notes”.

A. Use note 704-P__ for traffic control on 2-Lane 2-Way highways (plan note).
B. Use note 704-P__ for traffic control on 4-Lane Divided highways (plan note).
C. Use note 704-P__ for traffic control on Interstate Highways (plan note).
D. Show the ADT on the basis of estimate sheet. If the ADT is 750 or less, sign no. W8-12-48 "No Center Stripe" is used in place of short term pavement markings.
E. Pilot Car: For basis of estimate use 5 hr/mi and round up to nearest 50.
F. Flagging: For basis of estimate use 20 hr/mi and round up to nearest 50.
G. On first time seal coats, include approaches and private drives to the right of way.
H. On first time seal coats, include railroad crossings and use note 107-___ (standard note). RAILWAY PROTECTION INSURANCE should be provided and has a bid item.
I. On re-seals, exclude railroad crossings and ~~use~~ ____ include a note.
J. Use Plastic Pavement Marking Film for railroad crossings. Use note 762-P__ (plan note) for installation of pavement marking prior to the seal coat.